

AL-1-1711
C-2

Agtech CENTRE Innovator

Volume 11 Issue 3 August 2011



DRIVING THE 'DIGESTATE' OPPORTUNITY

Learning how to fully capture the nutrient value of this by-product can add value to livestock operations and make anaerobic digestion a more viable option.

"Return to the land what comes from the land."

For research engineer Mahendran Navaratnasamy of Alberta Agriculture and Rural Development (ARD), that's a simple way to describe what the job is for anyone looking to make livestock agriculture more sustainable.

"Everything involved with livestock production comes from the land," he says. "We need to put back into the land to have a sustainable cycle that is healthy and productive."

Navaratnasamy and his colleagues keep that simple truth in mind when it comes to the challenge of manure management. What to do with manure? First, think of it as a resource, not a waste. Next, look for ways to capture the value it has and put it back into the land.

This straightforward thinking is paying dividends as agricultural engineers and researchers like Navaratnasamy and his colleague, engineer Virginia Nelson look for ways to help the industry make progress in the adoption of new manure management options.

One of the latest and most promising of these is the process of anaerobic digestion using biodigesters. This process opens up the opportunity for livestock farmers to use manure as a resource to produce biogas, which can be used as an on-farm energy source and, at larger scales, potentially as an off-farm energy source and additional revenue stream.

One challenge with this option is what to do with the leftover material from the anaerobic digestion process – a frothy, manure-based slurry called "digestate."

That's driving a new focus on learning more about the potential of this material for land application.

"Digestate is basically decomposed manure minus the gaseous components that are released in the anaerobic digestion process," says Nelson. "It's not quite the same composition as regular manure, but the important thing is it retains the nutrients. In theory, it should have similar value as a nutrient resource for land application, which can help producers keep healthy, productive soils and potentially reduce commercial fertilizer costs. Because of its composition, digestate may also have handling and environmental advantages compared to other forms of manure."

Government
of Alberta ■

Alberta

For producers, part of the benefit is about good land stewardship and reduction of potential waste, says Navaratnasamy. "Ultimately, this can also translate into less cost and higher profit potential. That combination of environmental and economic benefits is what we're looking to develop in all new options."

Where digestate fits

To understand the significance of digestate its important to understand where it fits in the process of anaerobic digestion. This process is defined as the breaking down of organic material in an oxygen free environment.

This process takes place in an insulated, oxygen free tank or container called an anaerobic digester or biodigester. It's within this "no air" environment that certain bacteria and other microscopic bugs excel at the work of separating biomaterial such as manure into its various components.

In the case of livestock manure, this separation process results in two components - a biogas made up primarily of methane and carbon dioxide, and the digestate. The biogas is funneled out of the biodigester and stored for use as a fuel source. While some small scale systems use the biogas as-is, other small systems and all large scale systems also use a purification process to improve the quality and consistency of the biogas.

Biogas can be burned to produce electricity and heat, just like natural gas - either for use at an on-farm level or potentially for broader use.

Developing best practices

The digestate can be used for land application as a nutrient source for crops, in the same manner as liquid manure. There is also potential to further process the digestate into a bio-based fertilizer.

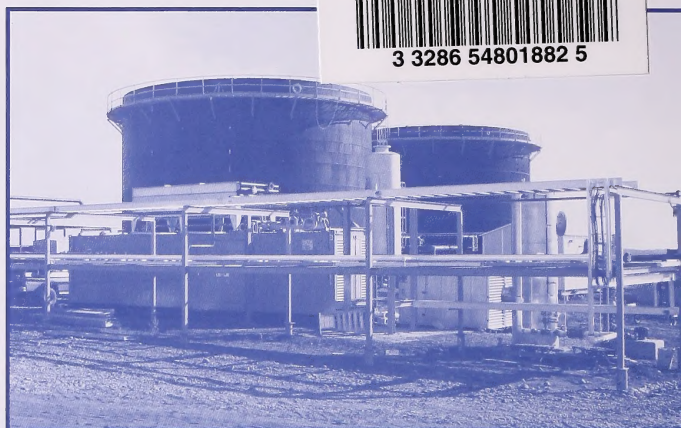
However, because the process of anaerobic digestion using biodigesters is in the early stages of adoption, there are many important questions to answer in order to use digestate effectively in Alberta. These include pinpointing how digestate is different from other forms of manure, what this means for land application, what this means for greenhouse gas emissions and, ultimately, what are the best ways to use this resource in different cropping systems.

ARD and others are looking into these questions to help provide livestock operations with information they can use to support their decision making and strategies.

Major study underway

Highland Feeders at Vegreville has the sixth largest feedlot in Canada. A pioneering large-scale manure utilization system has been implemented at this operation and is called an Integrated Manure Utilization System (IMUS).

A large study is led by Agriculture and Agri-Food Canada, with ARD as a partner, and includes a number of components aimed at investigating uses of the byproduct, searching for other sources for the digester, expanding the biogas industry in Alberta, and optimizing production with barley, biogas and ethanol production.



"Bio-digesters are also generating interest among a growing number of key players in industry and government as a key technology to support a more sustainable agriculture and energy future."

Nelson is working on a component that is studying the value of digestate. In this component, manure from Highland Feeders beef cattle operation is used to produce biogas and the byproduct digestate, which is land applied to fields used to grow barley. The digestate is applied as a slurry, a solid separated product, and a pelletized product. Results are compared to solid manure to allow for assessments of which strategies work better under different circumstances.

The study also includes a component focused on monitoring greenhouse gases emissions involved in the different digestate management approaches.

Rising option of the future

Biodigesters are not commonly adopted in Western Canada or the country as a whole, says Navaratnasamy. However, in Alberta for example, it seems that there is growing interest every year and typically a few new operations every couple years are making the investment to get involved. "The best initial fit appears to be for beef cattle operations and this sector is where virtually all biodigester adoption in the province has occurred," he says.

There are many challenges to the viability of biogas production, ranging from high investment costs paired with long-term paybacks, to a handful of important technological and logistical difficulties to overcome. But against the current backdrop of the push to more sustainable agricultural systems and renewable energy sources, biogas production is an emerging option that is generating attention. ♦

AgTech Centre
Alberta Agriculture and Rural Development
Technology and Innovation Branch
Environmental Stewardship Division
3020 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Phone: (403) 329-1212
Fax: (403) 328-5562



AgTech Innovator

Articles included in the AgTech Innovator may be reproduced with acknowledgement of source. Further information on AgTech Centre is available by contacting the Centre directly.